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Perspective

Respiratory Care and Monitoring of an Invasively Ventilated Neonates

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DESCRIPTION

Noninvasive ventilation techniques are increasingly being used in Neonatal Intensive Care Units (NICUs), although invasive ventilation is still frequently required to treat preterm and term newborns with respiratory insufficiency. Nowadays, prolonged invasive breathing is viewed as a significant risk factor for the development of Bronchopulmonary Dysplasia (BPD), and extremely preterm newborns are extubated very rapidly. Volume-targeted ventilation modes have shown superior outcomes when compared to pressure-limited ventilation modes, and there are many other ventilation modes and tactics available to maximise mechanical ventilation and minimise ventilator-induced lung damage. Use of the proper size endotracheal tube, positioning of the patient, nursing care, respiratory kinesiotherapy, sedation and analgesia, and infection prevention, specifically the prevention of ventilator-associated pneumonia and nosocomial infection, as well as the treatment of complications like air leaks and pulmonary haemorrhage, are all significant factors to take into account when ventilating newborns. Aspects of breathing in patients receiving palliative care and Extracorporeal Membrane Oxygenation (ECMO) are of growing attention nowadays. In addition to capnography, which is increasingly employed for monitoring ventilated neonates, echocardiography is now a standard procedure in the majority of neonatal hospitals. Lung ultrasonography is a developing diagnostic technique and can be of considerable use in helping to monitor the ventilated neonate. Near Infrared Spectroscopy (NIRS) is becoming an appealing tool in helping to avoid neurological impairment.

In NICUs, individualized nursing care and respiratory treatment are essential and are more common. Each mechanically ventilated newborn has been shown to require one nurse's care on average for 60% of the time. Infection and its prevention are major issues for newborn ventilated patients, especially for those with extremely low birth weights. The second most prevalent type of nosocomial infection and a common device-related complication, Ventilator-Associated Pneumonia (VAP), is defined as a lung infection diagnosed in a mechanically ventilated patient for more than 48 hours (>48 h). It can occur at a variable rate of 2.3 to 10.9 episodes per 1000 ventilator days in developed countries. There are no agreed standards for diagnosing VAP in the newborn period. Neonatals have been using the Centers for Disease Control's (CDC) less than 12-month-old infant VAP diagnostic guidelines, which state that the ventilated patient must meet clinical (at least one of the following: presence of tachypnea, apnea, and/or retractions; increased need for supplemental oxygen; respiratory settings to achieve targeted respiratory values; amount of respiratory secretions; incidence of desaturation events) and isolation of a microorganism obtained by bronchoalveolar lavage or isolation of a microorganism in blood culture without any other focus or histopathological examination.

The diagnosis of VAP cannot be made with sufficient accuracy by tracheal aspirate microbiological analysis since airway colonisation cannot be excluded using this method.

Bronchoscopic bronchoalveolar lavage and protected specimen brush are the gold standard for microbiological sampling of the airway, but due to their invasive nature, they shouldn't be used on all newborns that have been intubated with small-diameter tubes instead of blind-protected bronchoalveolar lavage. There are a number of risk factors that might lead to VAP.

Among these, length of hospital stay, reintubation, enteral feeding, mechanical ventilation, transfusion, low birth weight, prematurity, bronchopulmonary dysplasia, and parenteral nutrition have been identified in a recent meta-analysis of observational studies. However, duration of mechanical ventilation and Extremely Low Birth Weight Babies (ELBW) infants appear to be the most significant in multivariate analysis.

Contrarily, switching from every seven to every 14 days between ventilator circuit adjustments does not appear to have an impact on the VAP rate. Gram-negative bacteria, including *Pseudomonas aeruginosa*, Enterobacter species, and Klebsiella species, are the most frequent culprits in VAP. However Gram-positive bacteria, specifically coagulase negative staphylococci and *Staphylococcus aureus*, can also be implicated. Tracheal aspirate sampling typically yields polymicrobial cultures.

There is no agreement on how to handle VAP initially. Based on potential causal agents and local antimicrobial resistance trends,

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the first line of empirical therapy should comprise wide spectrum antibiotics that are effective against both Gram-positive and Gram-negative bacteria. VAP is linked to a longer hospital stay and higher mortality. It has been demonstrated that the use of newborn VAP prevention bundles reduces the incidence of VAP in NICUs. Such bundles, which combine numerous evidence-based strategies, have shown to enhance practices more than the advantages of each practice taken individually. Use of medications that interfere with gastric acidity, use of antibiotic bowel decontamination and oral hygiene, use of separate oral and tracheal suctions, use of closed multiuse suction catheters, frequency at which suctioning systems should be changed, routine changing of breathing circuits, assessment of readiness for extubation and cautious evaluation of the need for reintubation, and assessment of readiness for extubation and cautious evaluation of the need for reintubation should all be included. As with other illnesses connected to healthcare, improving carer training and hand hygiene practices is still a crucial step in reducing the occurrence of VAP. For the treatment of newborn infants with respiratory insufficiency, invasive ventilation is frequently required, and the neonatal patient has special physiological features. Each clinical circumstance mandates a worldwide focus on the patient's entire clinical condition and any related comorbidities. Individualized respiratory therapy that takes into account the patient's features, clinical status, accompanying comorbidities, and overall prognosis is required.